Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	STRUCTURAL ANALYSIS
COURSE CODE	:	BFC 21403
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	1.	ANSWER ALL QUESTIONS
	2.	THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSED BOOK.**
	3.	STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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Q1 (a) **Figure Q1** shows a statically determinate plane truss subjected to a vertical concentrated load at C and E. The truss is made using steel with Modulus of Elasticity is 210 GPa, and the cross section area for all members are 30 mm^2. Assuming P is the month of your birthday and a is half of P, determine the vertical displacement at F. The solution can be based on Method of Conservation Energy or Method of Virtual Work.

(21 marks)

(b) If support A is a pinned, what will happen to the truss structure?

(4 marks)

Q2 (a) **Figure Q2** shows a frame with tie rod at joint B and C. The beam carries a concentrated load 300kN at span BC. Analysis and sketch the shear force and bending-moment diagram for the entire frame.

(20 marks)

(b) If the tie rod at joint B and C are removed, what will happen to the frame and briefly explain the changes in analysing the frame

(5 marks)

Q3 (a) As a junior structural engineer, you are responsible to prepare the analysis report of steel beam and present to the chief structural engineer. That steel beam has been designed with fixed support at point A and pinned support at Point C as shown in **Figure Q3 (a)**.Your report should have the following items;

(i) the influence line for the vertical reaction and moment at Point A.

(8 marks)

(ii) the maximum moment at Point B if concentrated load of 100 kN is applied at Point B and 30 kN/m uniform load is applied from Point B to C.

(4 marks)

(b) You have been appointed as a junior structural engineer to design a truss bridge across Sungai Kiri with a pin and roller supports at point A and G, respectively as shown in **Figure Q3 (b)**. The span of each horizontal member is 4 m and the height of vertical member is also 4 m. Your task is analyze and present the influence diagram for members JK and DE.

(13 marks)

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Q4 (a) Briefly explain **FIVE (5)** significance of shape factor, S in plastic analysis

(5 marks)

(b) Simply supported plate girder is loaded with load as illustrated in **Figure Q4(b).** Determine the Plastic Moment, M_p of the plate girder using virtual work method.

(10 marks)

(c) A cross section of simply supported plate girder is shown in **Figure Q4 (c).** Given that steel stress, $\sigma = 250$ N/mm^2.

(i) Determine the plastic moment, M_p.

(8 marks)

(ii) Calculate the plastic modulus, Z_p.

(2 marks)

– END OF QUESTIONS –

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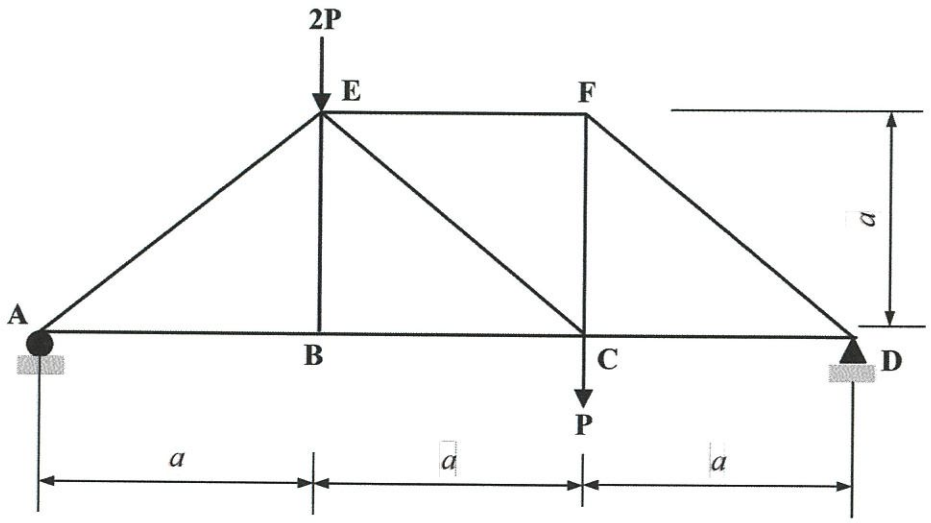

FIGURE Q1

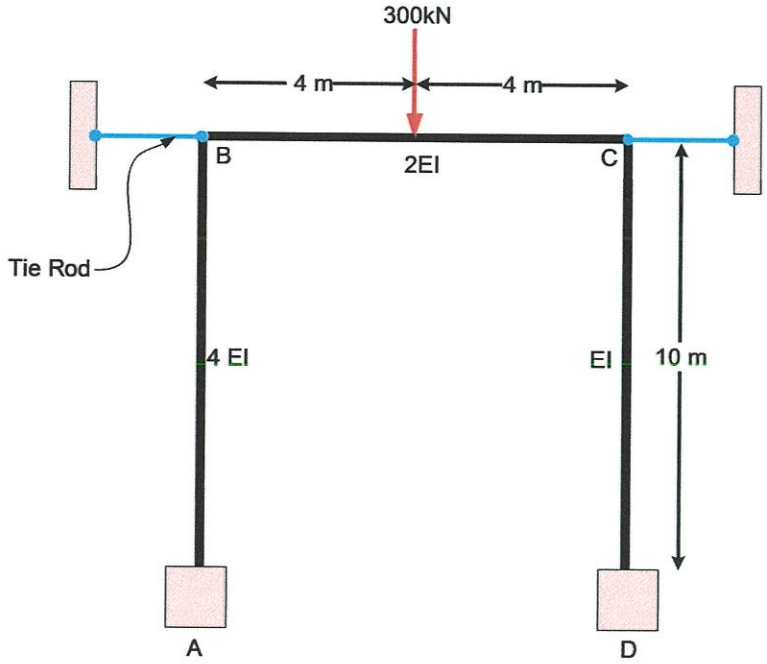

FIGURE Q2

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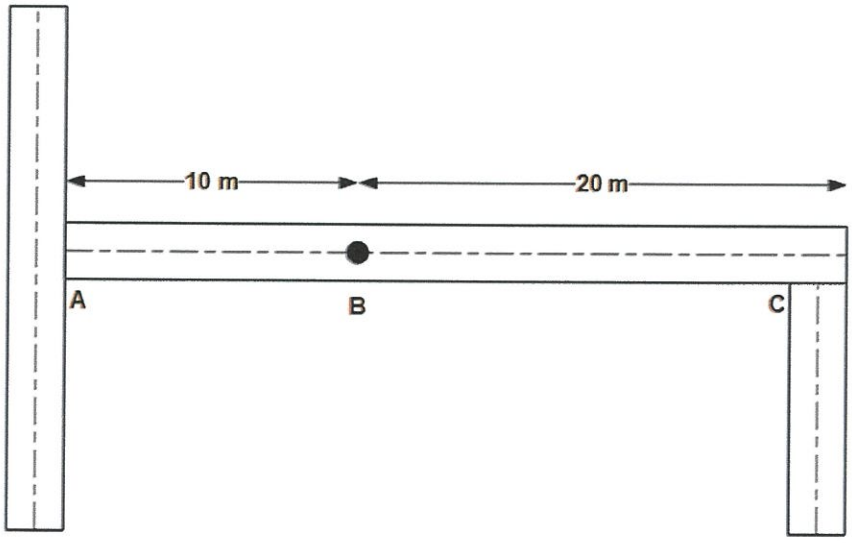

FIGURE Q3 (a)

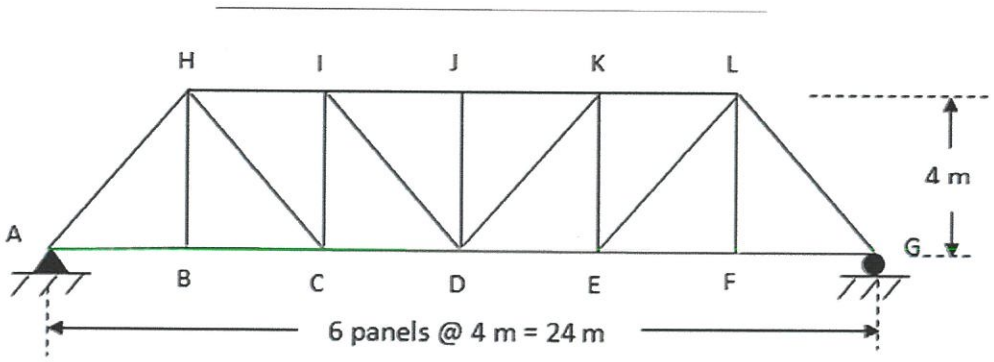

FIGURE Q3 (b)

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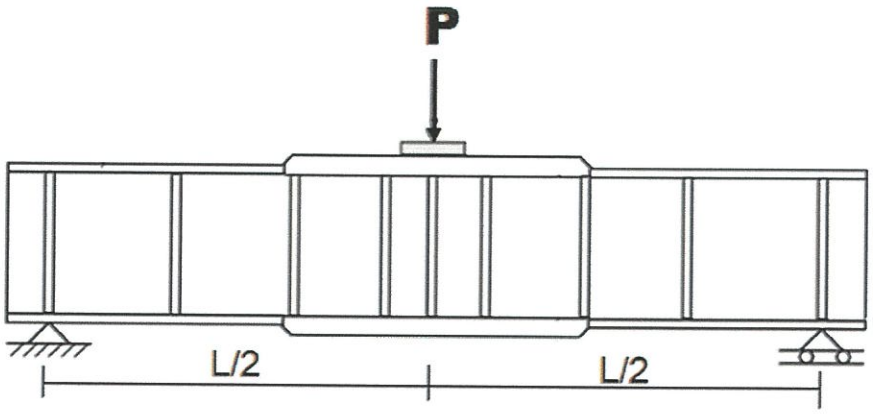

FIGURE Q4(a)

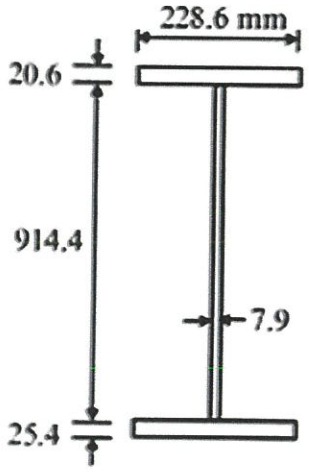

FIGURE Q4(b)

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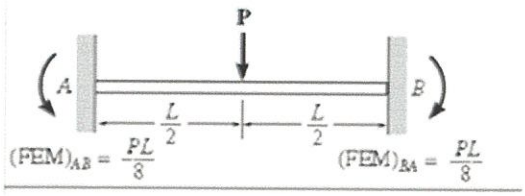
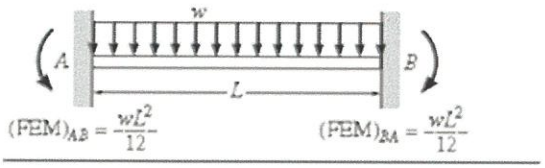
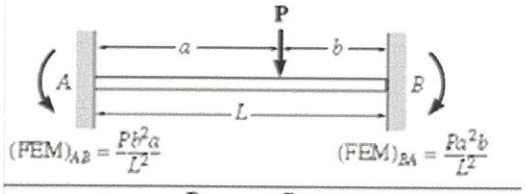
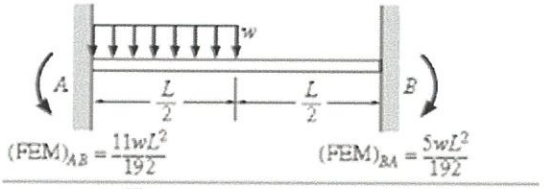
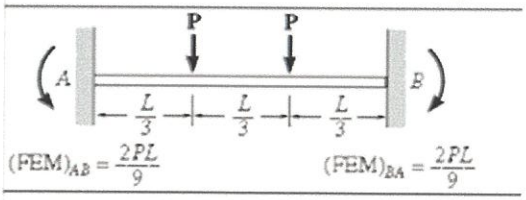
Fixed End Moment

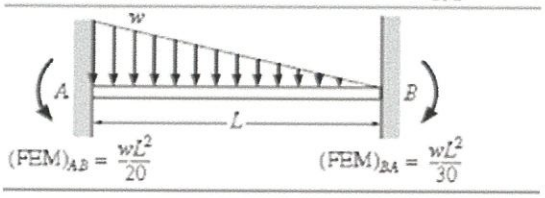


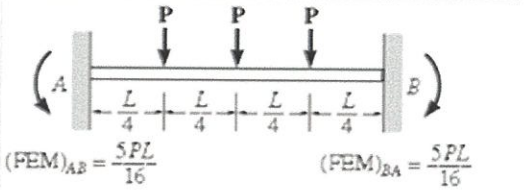


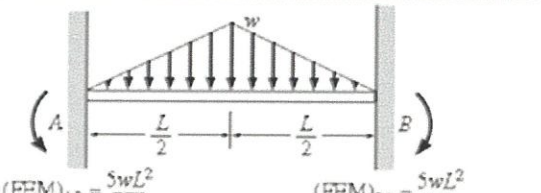












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